



User Manual

GeoMax Zenith35 Pro Series

English

Version 1.1

Introduction



This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to [1 Safety Directions](#) for further information.

Read carefully through the User Manual before you switch on the product.

The content of this document is subject to change without prior notice. Ensure that the product is used in accordance with the latest version of this document.

Product identification

The model and serial number of your product are indicated on the type plate.

Always refer to this information when you contact your agency or GeoMax authorised service workshop.

Trademarks

- Windows® is a registered trademark of Microsoft Corporation in the United States and other countries
- Bluetooth® is a registered trademark of Bluetooth SIG, Inc.
- microSD Logo is a trademark of SD-3C, LLC.

All other trademarks are the property of their respective owners.

Validity of this manual

This manual applies to the Zenith35 ProGNSS instrument.



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1 Safety Directions

1.1 General Introduction

Description

The following directions enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

About warning messages






Warning messages are an essential part of the safety concept of the instrument. They appear wherever hazards or hazardous situations can occur.

Warning messages...

- make the user alert about direct and indirect hazards concerning the use of the product.
- contain general rules of behaviour.

For the users' safety, all safety instructions and safety messages shall be strictly observed and followed! Therefore, the manual must always be available to all persons performing any tasks described here.

DANGER, WARNING, CAUTION and **NOTICE** are standardised signal words for identifying levels of hazards and risks related to personal injury and property damage. For your safety, it is important to read and fully understand the following table with the different signal words and their definitions! Supplementary safety information symbols may be placed within a warning message as well as supplementary text.

Type	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury.
	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in appreciable material, financial and environmental damage.
	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

1.2 Definition of Use

Intended use

- Computing with software
- Recording measurements
- Carrying out measurement tasks using various GNSS measuring techniques
- Recording GNSS and point related data
- Remote control of product
- Data communication with external appliances
- Measuring raw data and computing coordinates using carrier phase and code signal from GNSS satellites (GNSS systems)

Reasonably foreseeable misuse

- Use of the product without instruction.
- Use outside of the intended use and limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obvious damages or defects.
- Use with accessories from other manufacturers without the prior explicit approval of GeoMax.
- Inadequate safeguards at the working site.
- Controlling of machines, moving objects or similar monitoring application without additional control and safety installations.

1.3

Limits of Use

Environment

Suitable for use in an atmosphere appropriate for permanent human habitation. Not suitable for use in aggressive or explosive environments.

⚠ WARNING

Working in hazardous areas, or close to electrical installations or similar situations

Life Risk.

Precautions:

- ▶ Local safety authorities and safety experts must be contacted by the person responsible for the product before working in such conditions.

1.4

Responsibilities

Manufacturer of the product

GeoMax AG, CH-9443 Widnau, hereinafter referred to as GeoMax, is responsible for supplying the product, including the user manual and original accessories, in a safe condition.

Person responsible for the product

The person responsible for the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual
- To ensure that it is used in accordance with the instructions
- To be familiar with local regulations relating to safety and accident prevention
- To inform GeoMax immediately if the product and the application becomes unsafe
- To ensure that the national laws, regulations and conditions for the operation of radio transmitters or lasers are respected

1.5

Hazards of Use

⚠ DANGER

Risk of electrocution

Because of the risk of electrocution, it is dangerous to use poles, levelling staffs and extensions in the vicinity of electrical installations such as power cables or electrical railways.

Precautions:

- ▶ Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.



WARNING

Distraction/loss of attention

During dynamic applications, for example stakeout procedures, there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.

Precautions:

- ▶ The person responsible for the product must make all users fully aware of the existing dangers.

WARNING

Inadequate securing of the working site

This can lead to dangerous situations, for example in traffic, on building sites and at industrial installations.

Precautions:

- ▶ Always ensure that the working site is adequately secured.
- ▶ Adhere to the regulations governing safety, accident prevention and road traffic.

CAUTION

Not properly secured accessories

If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people can sustain injury.

Precautions:

- ▶ When setting up the product, make sure that the accessories are correctly adapted, fitted, secured, and locked in position.
- ▶ Avoid subjecting the product to mechanical stress.

WARNING

Lightning strike

If the product is used with accessories, for example masts, staffs, poles, you may increase the risk of being struck by lightning.

Precautions:

- ▶ Do not use the product in a thunderstorm.

DANGER

Risk of being struck by lightning

If the product is used with accessories, for example on masts, staffs, poles, you may increase the risk of being struck by lightning. Danger from high voltages also exists near power lines. Lightning, voltage peaks, or the touching of power lines can cause damage, injury and death.

Precautions:

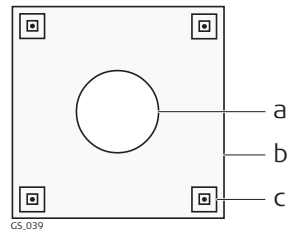
- ▶ Do not use the product in a thunderstorm as you can increase the risk of being struck by lightning.
- ▶ Be sure to remain at a safe distance from electrical installations. Do not use the product directly under or close to power lines. If it is essential to work in such an environment contact the safety authorities responsible for electrical installations and follow their instructions.
- ▶ If the product has to be permanently mounted in an exposed location, it is advisable to provide a lightning conductor system. A suggestion on how to design a lightning conductor for the product is given below. Always follow the regulations in force in your country regarding grounding antennas and masts. These installations must be carried out by an authorised specialist.
- ▶ To prevent damages due to indirect lightning strikes (voltage spikes) cables, for example for antenna, power source or modem should be protected with appropriate protection elements, like a lightning arrester. These installations must be carried out by an authorised specialist.
- ▶ If there is a risk of a thunderstorm, or if the equipment is to remain unused and unattended for a long period, protect your product additionally by unplugging all systems components and disconnecting all connecting cables and supply cables, for example, instrument - antenna.

Lightning conductors

Suggestion for design of a lightning conductor for a GNSS system:

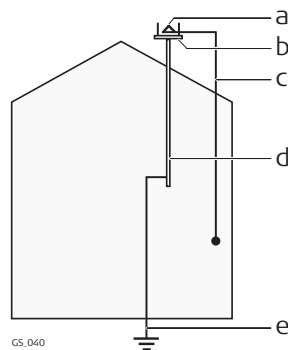
1. On non-metallic structures
Protection by air terminals is recommended. An air terminal is a pointed solid or tubular rod of conducting material with proper mounting and connection to a conductor. The position of four air terminals can be uniformly distributed around the antenna at a distance equal to the height of the air terminal.
The air terminal diameter should be 12 mm for copper or 15 mm for aluminium. The height of the air terminals should be 25 cm to 50 cm. All air terminals should be connected to the down conductors. The diameter of the air terminal should be kept to a minimum to reduce GNSS signal shading.
2. On metallic structures
Protection is as described for non-metallic structures, but the air terminals can be connected directly to the conducting structure without the need for down conductors.

Air terminal arrangement, plan view



- a Antenna
- b Support structure
- c Air terminal

Grounding the instrument/antenna



- a Antenna
- b Lightning conductor array
- c Antenna/instrument connection
- d Metallic mast
- e Connection to earth

WARNING

Incorrect fastening of the external antenna

Incorrect fastening of the external antenna to vehicles or transporters poses the risk of the equipment being broken by mechanical influence, vibration or airstream. This may result in accident and physical injury.

Precautions:

- ▶ Attach the external antenna professionally. The external antenna must be secured additionally, for example by use of a safety cord. Ensure that the mounting device is correctly mounted and able to carry the weight of the external antenna (>1 kg) safely.

⚠ WARNING

If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:

▶



The product must not be disposed with household waste. Dispose of the product appropriately in accordance with the national regulations in force in your country. Always prevent access to the product by unauthorised personnel.

Product-specific treatment and waste management information is available from GeoMax AG.

⚠ WARNING

Only GeoMax authorised service workshops are entitled to repair these products.

1.5.1

Charger and Batteries

For the AC/DC power supply:

⚠ WARNING

Electric shock due to missing ground connection

If unit is not connected to ground, death or serious injury can occur.

Precautions:

- ▶ The power cable and power outlet must be grounded!



For the AC/DC power supply and the battery charger:

⚠ WARNING

Electric shock due to use under wet and severe conditions

If unit becomes wet it may cause you to receive an electric shock.

Precautions:

- ▶ If the product becomes humid, it must not be used!
- ▶ Use the product only in dry environments, for example in buildings or vehicles.



- ▶ Protect the product against humidity.

For the AC/DC power supply and the battery charger:

 **WARNING**

Unauthorised opening of the product

Either of the following actions may cause you to receive an electric shock:

- Touching live components
- Using the product after incorrect attempts were made to carry out repairs.

Precautions:

- ▶ Do not open the product!
 - ▶ Only GeoMax authorised service centres are entitled to repair these products.
-

 **WARNING**

Short circuit of battery terminals

If battery terminals are short circuited e.g. by coming in contact with jewellery, keys, metallised paper or other metals, the battery can overheat and cause injury or fire, for example by storing or transporting in pockets.

Precautions:

- ▶ Make sure that the battery terminals do not come into contact with metallic objects.
-

 **WARNING**

Inappropriate mechanical influences to batteries

During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

Precautions:

- ▶ Before shipping the product or disposing it, discharge the batteries by the product until they are flat.
 - ▶ When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed.
 - ▶ Before transportation or shipping, contact your local passenger or freight transport company.
-

 **WARNING**

Exposure of batteries to high mechanical stress, high ambient temperatures or immersion into fluids

This can cause leakage, fire or explosion of the batteries.

Precautions:

- ▶ Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.
-

 **WARNING**

Wet or moisture conditions

The housing around the battery has wiring which may produce a short-circuit.

Precautions:

- ▶ Do not place the battery system in water or expose it to moisture, lubricants, solvents or any other liquid.
-

 **WARNING**

Incorrect battery mounting

Wrong mounting of the battery increases the risk of fire, electric shock and damage.

Precautions:

- ▶ Mount the battery in horizontal position.
 - ▶ Secure the battery in order to prevent slipping and tilting.
-

 **WARNING**

Damaged battery

If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.

Precautions:

- ▶ Protect the battery against mechanical damages.

 **WARNING**

Damaged battery housing

There is a risk of fire. In case, skin or eyes have come into direct contact with electrolytes leaking from the battery, rinse them thoroughly with clear water. Immediately contact a doctor.

Precautions:

- ▶ Stop using the battery.
- ▶ Turn off any charging in action.
- ▶ If any electrolytes should leak from a damaged battery, avoid skin contact and direct inhalation of gases.

 **WARNING**

Hot battery surface while charging

Risk of fire.

Precautions:

- ▶ Only charge battery on a non-flammable surface.
- ▶ Refer to the battery manufacturer manual for the correct handling and use of the battery.

1.6

Electromagnetic Compatibility (EMC)

Description

The term Electromagnetic Compatibility is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances to other equipment.

 **WARNING**

Electromagnetic radiation

Electromagnetic radiation can cause disturbances in other equipment.

Precautions:

- ▶ Although the product meets the strict regulations and standards which are in force in this respect, GeoMax cannot completely exclude the possibility that other equipment may be disturbed.

 **CAUTION**

Use of the product with accessories from other manufacturers. For example field computers, personal computers or other electronic equipment, non-standard cables or external batteries

This may cause disturbances in other equipment.

Precautions:

- ▶ Use only the equipment and accessories recommended by GeoMax.
- ▶ When combined with the product, they meet the strict requirements stipulated by the guidelines and standards.
- ▶ When using computers, two-way radios or other electronic equipment, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

 **CAUTION**

Intense electromagnetic radiation. For example, near radio transmitters, transponders, two-way radios or diesel generators

Although the product meets the strict regulations and standards which are in force in this respect, GeoMax cannot completely exclude the possibility that function of the product may be disturbed in such an electromagnetic environment.

Precautions:

- ▶ Check the plausibility of results obtained under these conditions.

 **CAUTION**

Electromagnetic radiation due to improper connection of cables

If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.

Precautions:

- ▶ While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

Radios or digital cellular phones

 **WARNING**

Use of product with radio or digital cellular phone devices

Electromagnetic fields can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircrafts. Electromagnetic fields can also affect humans and animals.

Precautions:

- ▶ Although the product meets the strict regulations and standards which are in force in this respect, GeoMax cannot completely exclude the possibility that other equipment can be disturbed or that humans or animals can be affected.
- ▶ Do not operate the product with radio or digital cellular phone devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- ▶ Do not operate the product with radio or digital cellular phone devices near to medical equipment.
- ▶ Do not operate the product with radio or digital cellular phone devices in aircrafts.
- ▶ Do not operate the product with radio or digital cellular phone devices for long periods with the product immediately next to your body.

1.7

FCC Statement, Applicable in U.S.

 **WARNING**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

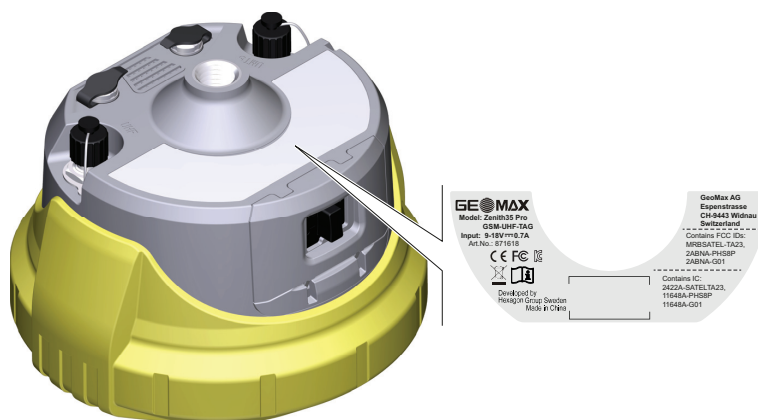
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

 **CAUTION**

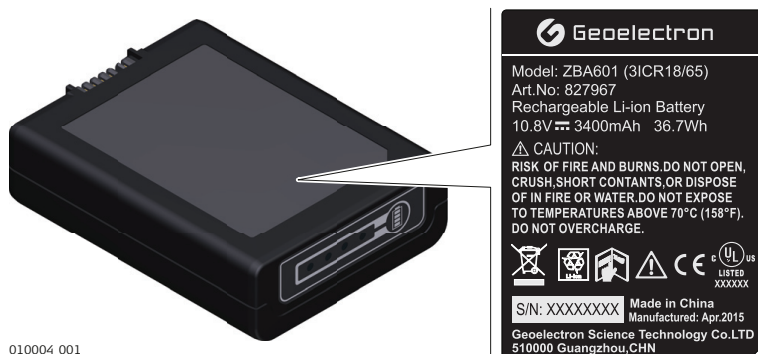
Changes or modifications not expressly approved by GeoMax for compliance could void the user's authority to operate the equipment.

Labelling Zenith35 Pro



012986_001

Labelling internal battery ZBA601



010004_001

WARNING

This Class (B) digital apparatus complies with Canadian ICES-003.
 Cet appareil numérique de la classe (B) est conforme à la norme NMB-003 du Canada.

Canada Compliance Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Canada Déclaration de Conformité

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2

Description of the System

2.1

System Components

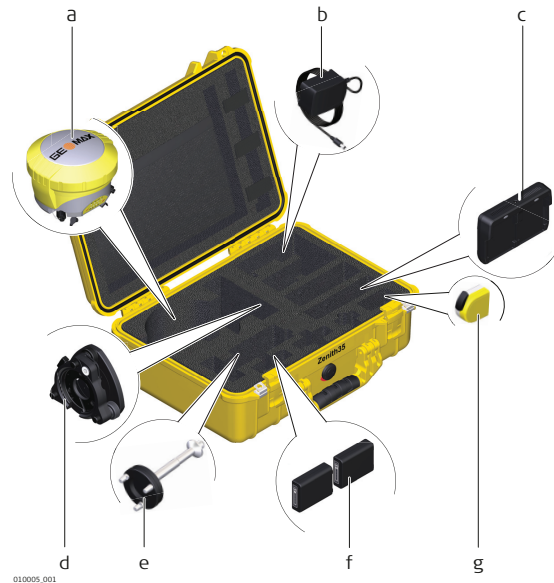
Main components

Component	Description
Instrument	A GNSS receiver with integrated communication devices.
Field controller	A multi-purpose device enabling the control of GeoMax instruments.
GeoMax Geo Office	An office software used for the processing of raw GNSS data.
Zenith35 Pro WebManager	A web-based user interface used to manage the GNSS receiver.

2.2

Container Contents

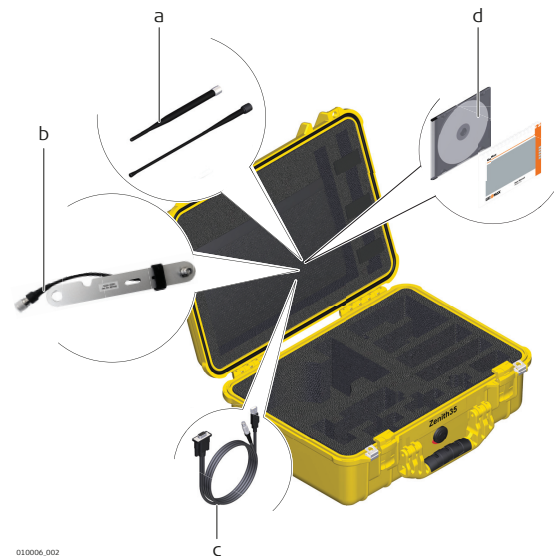
Container for Zenith35 Pro instrument and accessories part 1 of 2



- a Zenith35 Pro instrument
- b Cable for charger
- c Battery charger
- d Tribrach*
- e Carrier or field controller*
- f Battery
- g Measuring tape*

*optional

Container for Zenith35 Pro instrument and accessories part 2 of 2



- a UHF radio antenna and GSM antenna
- b GNSS antenna arm*
- c USB/RS232 cable
- d Quick Guide and CD

*optional

2.3 System Concept

2.3.1 Software Concept

Software upload The software can be uploaded using Zenith35 Pro WebManager.



Refer to [4.2.6 Zenith35 Pro WebManager](#).

2.3.2 Power Concept

General Use the GeoMax batteries, chargers and accessories or accessories recommended by GeoMax to ensure the correct functionality of the instrument. The external power supply cable should not be longer than 3 meters.

Power options

Power for the instrument can be supplied either internally or externally.

Internal power supply:	One battery fitting into the instrument.
External power supply:	9V to 18V DC external power input with over-voltage protection up to 28V.

2.3.3 Data Storage Concept

Description GNSS raw data can be recorded on the microSD card or internal memory.

Data storage device

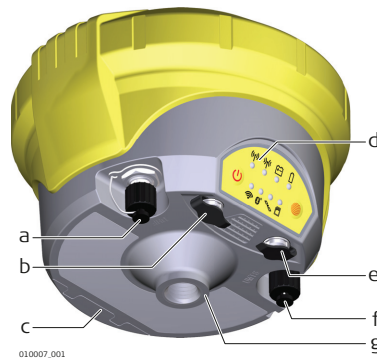


Unplugging connecting cables or removing the microSD card during the measurement can cause loss of data. Only remove the microSD card or unplug connecting cables when the instrument is switched off.

Device	Description
microSD card	The instrument has a microSD card slot fitted as standard. A microSD card can be inserted and removed.
Internal memory	The instrument has an internal memory fitted as standard. Available capacity: 4 GB.

2.4 Instrument Components

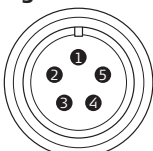
Zenith35 Pro components



- a TNC connector for UHF antenna
- b LEMO port 1
- c Battery compartment with SIM card and microSD card holder
- d Keyboard with LEDs, ON/OFF button and Function button
- e LEMO port 2
- f TNC connector for UMTS antenna
- g Antenna Reference Plane (ARP), where the instrument heights are measured.

2.5 Pin Assignments

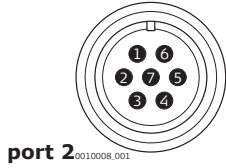
Pin assignments for



port 1_0010010.001

Pin	Signal Name	Function
1	PWR	12V power supply in
2	GND	Signal and chassis ground
3	TxD	RS232, transmit data
4	GND	Signal ground

Pin assignments for



Pin	Signal Name	Function
5	RxD	RS232, receive data

Pin	Signal Name	Function
1	NC	Not used
2	USB_D-	USB data line
3	PWR	5V power supply (USB)
4	USB_D+	USB data line
5	TxD	RS232, transmit data
6	RxD	RS232, receive data
7	GND	Signal ground

Plug types

Port1: LEMO-1, 5 pin, LEMO EEG.0B.305.CLN

Port2: LEMO-1, 7 pin, LEMO EEG.0B.307.CLN

2.6

The Antenna Reference Plane, ARP

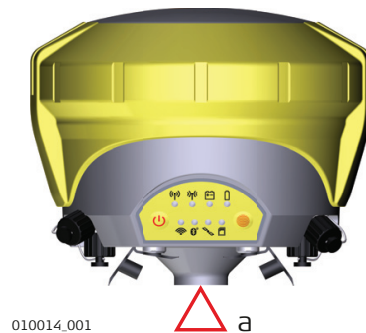
Description

The Antenna Reference Plane:

- is where the instrument heights are measured to.
- is where the phase centre variations refer to.
- varies for different instruments.

ARP for instrument

The ARP for the instrument is shown in the diagram.

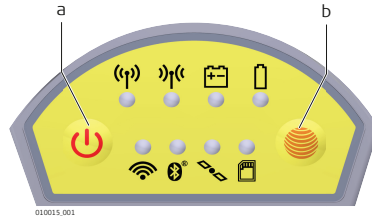


- a The Antenna Reference Plane is the underside of the thread.

3 User Interface



3.1 Keyboard

Using the keyboard





a ON/OFF key
b Function key

ON/OFF key



Key	Function
ON/OFF	 <p>If Zenith35 Pro is off: Turns on Zenith35 Pro when held for 2 s.</p> <p> While the Zenith35 Pro is booting the two Power LEDs flash.</p> <hr/> <p>If Zenith35 Pro is already on: Turns off Zenith35 Pro when held for 2 s.</p>

Function key

 All functions described assume the Zenith35 Pro is already on.

Key	Function
Function	 <p>Press and hold key for <1 s.</p> <p>Switches the Zenith35 Pro between rover or base mode.</p> <p>Press and hold key for 3 s.</p> <p>Updates the base position coordinates when Zenith35 Pro is in base mode. The RTK base LED flashes for 2 s. When no position is available, the LED flashes 2 times.</p> <p>Press and hold key for 5 s.</p> <p>Connects to the configured RTK base station or NTRIP server when the Zenith35 Pro is in rover mode. The RTK rover LED flashes for 2 s. No action if a rover mode is not configured.</p>

Key combinations

Key	Function
ON/OFF	 <p>Press and hold keys for 1 s.</p>
Function	 <p>The current almanacs stored on the GNSS instrument are deleted and new almanacs are downloaded. The Position LED flashes yellow three times.</p> <p>Press and hold keys for 5 s.</p> <p>The Memory LED flashes red quickly three times. The microSD card of the GNSS instrument is formatted. The Memory LED continues to flash red as the SD card is formatted.</p> <hr/> <p>Press and hold keys for 10 s.</p>

Key	Function
	The System RAM on the GNSS instrument is formatted. Settings of all installed software will be deleted. The Storage LED flashes red. The RTK Base and RTK Rover LEDs flash green. The Position LED flashes yellow quickly three times. After the formatting the System RAM, the GNSS instrument is turned off.

3.2

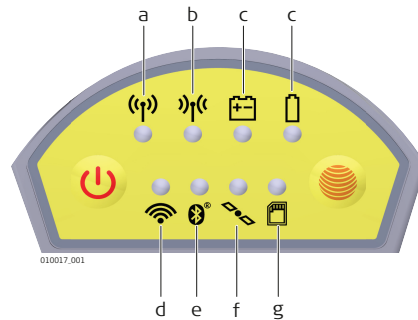
LED Indicators

LED indicators

Description

The Zenith35 Pro has Light Emitting Diode indicators. They indicate the basic instrument status.

Diagram



- a RTK Base LED
- b RTK Rover LED
- c Power LED
- d Wi-Fi LED
- e Bluetooth LED
- f Position LED
- g Storage LED

Description of the LEDs

IF the	is	THEN
Wi-Fi LED	green	Wi-Fi is in data mode and ready for connecting.
	blue	Wi-Fi has connected.
Bluetooth LED	green	Bluetooth is in data mode and ready for connecting.
	blue	Bluetooth has connected.
RTK Base LED	green	Zenith35 Pro is in RTK base mode. No RTK data is being passed to the interface of the communication device.
	flashing green	Zenith35 Pro is in RTK base mode. Data is being passed to the interface of the communication device.
RTK Rover LED	green	Zenith35 Pro is in rover mode. No RTK data is being received at the interface of the communication device.
	flashing green	Zenith35 Pro is in rover mode. RTK data is being received at the interface of the communication device.
Position LED	off	no satellites are tracked.
	flashing yellow	less than four satellites are tracked, a position is not yet available.
	yellow	a navigated position is available.
	flashing green	a code-only position is available.
Power LED	green	a fixed RTK position is available.
	off	battery is not connected, flat or Zenith35 Pro is switched off.
	green	power is 20% - 100%.

IF the	is	THEN
	red	power is 5% - 20%. The remaining time for which enough power is available depends on the type of survey, the temperature and the age of the battery.
	fast flashing red	power is low (<5%).
Storage LED	green	microSD card is inserted but no raw data is being logged.
	flashing green	raw data is being logged.
	flashing red	raw data is being logged but only 5% memory left.
	red	microSD card is full, no raw data is being logged or no microSD card is inserted but Zenith35 Pro is configured to log raw data.

4

Operation

4.1

Guidelines for Correct Results with GNSS Surveys

Undisturbed satellite signal reception

Successful GNSS surveys require undisturbed satellite signal reception, especially at the instrument which serves as a base. Set up the instrument in locations which are free of obstructions such as trees, buildings or mountains.

Steady instrument for static surveys

For static surveys, the instrument must be kept perfectly steady throughout the whole occupation of a point. Place the instrument on a tripod or pillar.

Centred and levelled instrument

Centre and level the instrument precisely over the marker.

4.2

Equipment Setup

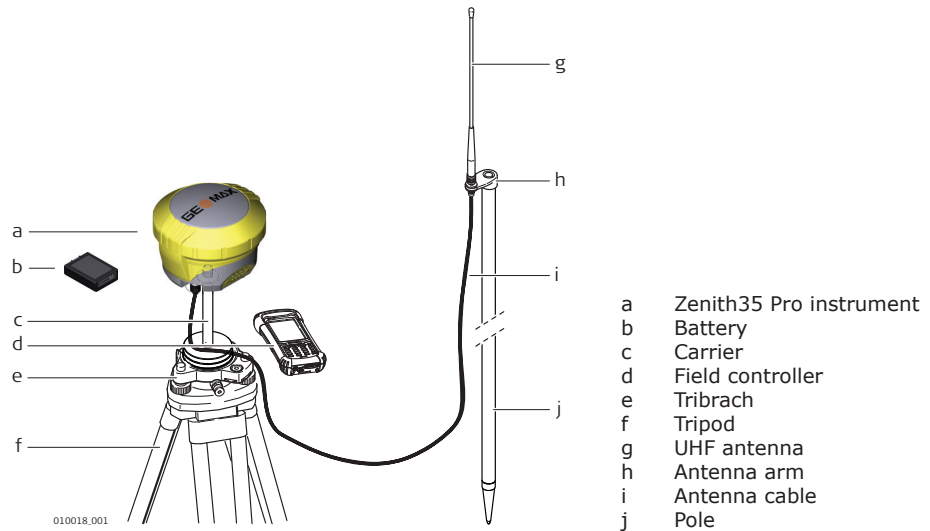
4.2.1

Setting up as a Real-Time Base

Use

The following equipment setup is used for real-time base stations. Raw observation data can also be collected for post-processing.

Equipment setup - Zenith35 Pro



Equipment setup step-by-step

1. Set up the tripod.
2. Mount the tribrach on the tripod.
3. Ensure that the tribrach is over the marker.
4. Mount and level the carrier on the tribrach.
5. Insert the battery into the instrument.
6. Connect the UHF antenna to the instrument using the antenna arm and the antenna cable.
7. Press the ON/OFF button on the instrument for 2 s to switch on the instrument.
8. Screw the instrument onto the carrier.
9. Check that the tribrach and carrier are still level.
10. Connect the field controller to the instrument through Bluetooth or through Wi-Fi to the Zenith35 Pro WebManager.
11. Measure the instrument height using the measuring tape. Refer to [2.6 The Antenna Reference Plane, ARP](#) for information on the instrument height.

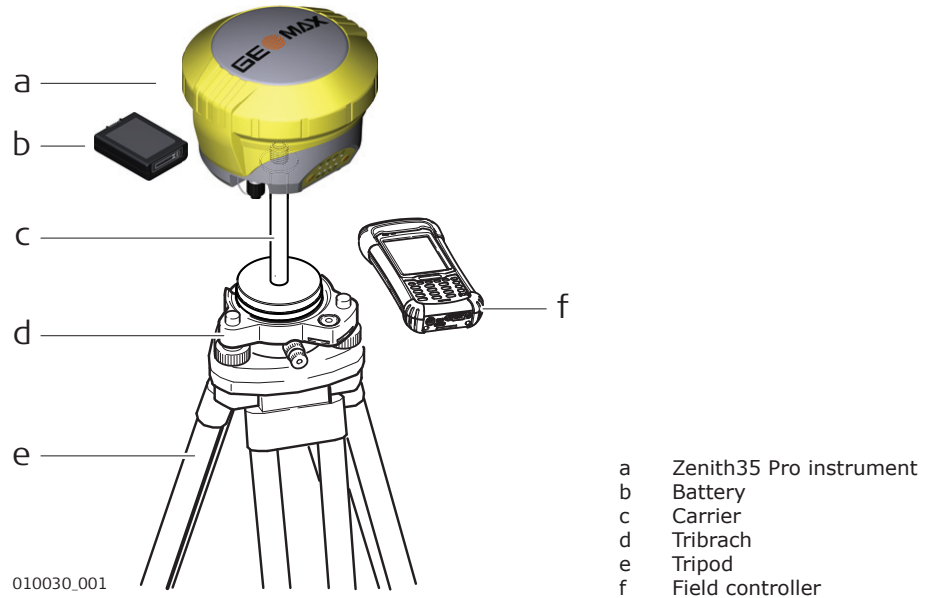
4.2.2

Setting up as a Post-Processing Base

Use

The following equipment setup is used for static operations over markers.

Equipment setup - Zenith35 Pro



Equipment setup step-by-step

1. Set up the tripod.
2. Mount the tribrach on the tripod.
3. Ensure that the tribrach is over the marker.
4. Mount and level the carrier on the tribrach.
5. Insert the battery into the instrument.
6. Press the ON/OFF button on the instrument for 2 s to switch on the instrument.
7. Screw the instrument onto the carrier.
8. Check that the tribrach and carrier are still level.
9. Connect the field controller to the instrument through Bluetooth or through Wi-Fi to the Zenith35 Pro WebManager.
10. Measure the instrument height using the measuring tape. Refer to [2.6 The Antenna Reference Plane, ARP](#) for information on the instrument height.

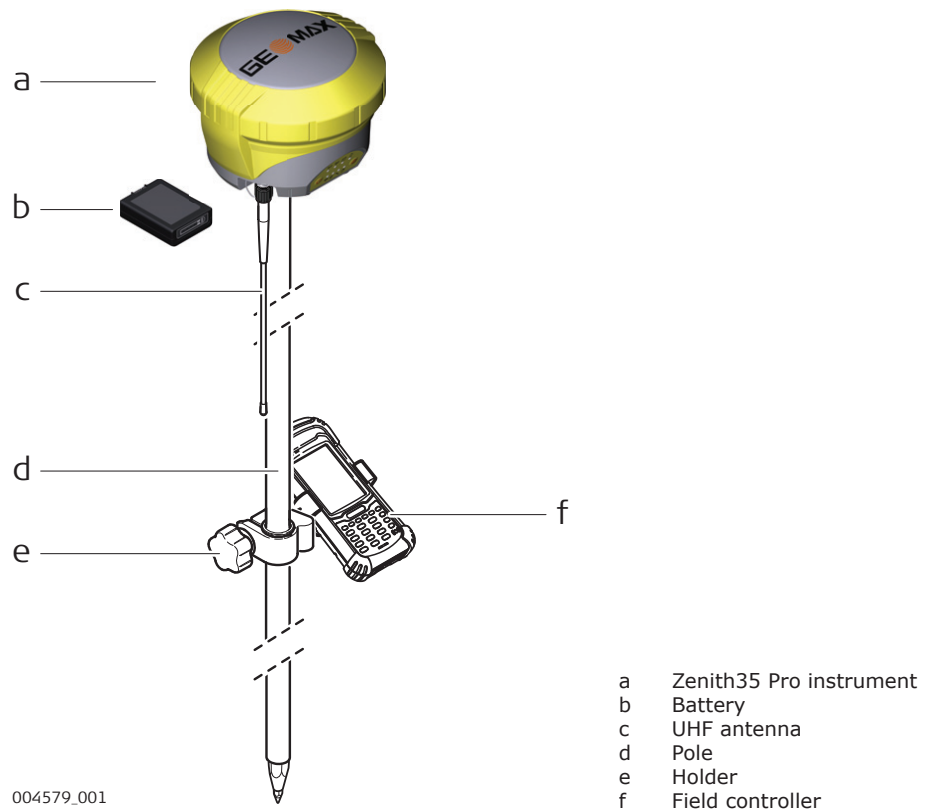
4.2.3

Setting Up as a Real-Time Rover

Use


The following equipment setup is used for real-time rover.

Equipment setup - Zenith35 Pro



004579_001

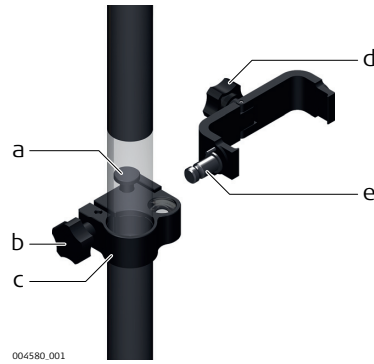
Equipment setup step-by-step

1. Attach the holder to the pole. Refer to [4.2.4 Fixing the Field Controller to a Holder and Pole](#).
2. Clip the field controller into the holder and lock it by tighten the screw on the holder.
3. Turn on the field controller.
4. Insert the battery into the instrument.
5. Connect the UHF antenna to the instrument. The connection is only required when using the internal radio.
6. Press ON/OFF key on the instrument for 2 s to switch on the instrument.
7. Screw the instrument to the top of the pole.
8. Connect the field controller to the instrument through Bluetooth.
 If RTK corrections are received with the field controller, the field controller must be connected to the instrument by serial cable.

4.2.4

Fixing the Field Controller to a Holder and Pole

Components of the holder



Clamp

- a Locking pin
- b Tightening screw
- c Pole clamp

Holder

- d Tightening screw
- e Pin

Fixing the field controller to the holder step-by-step

1. Insert the pole into the clamp hole.
2. Tighten the clamp with the tightening screw.
3. To attach the holder to the clamp insert the pin into the catch of the clamp while pushing down the locking pin.
4. Place the field controller in the holder.
5. Tighten the screw of the holder to fix the field controller to the holder.

4.2.5

Connecting to a Personal Computer

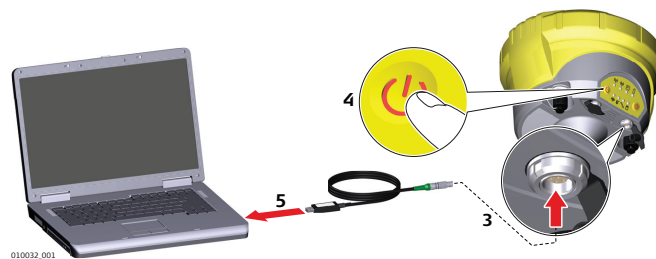
Description

The instrument is connected to a Personal Computer via serial/USB cable.

Install software

1. Start the PC.
2. Download the cable driver from the GeoMax website.
3. Install the cable driver on a PC using a Windows operating system.

Connect instrument to PC



1. Start the PC.
2. Plug the included cable into the port of the instrument.
3. Turn on the instrument.
4. Plug the cable into the USB port of the PC. If Windows Hardware Wizard starts up, select **CLOSE**.

4.2.6

Zenith35 Pro WebManager

Description

The Zenith35 Pro WebManager software can be used to set up, configure and operate the instrument, download data from the instrument and microSD card, enter licence keys and upload firmware.

Start Zenith35 Pro Web-Manager

1. Turn on the Zenith35 Pro instrument.
2. Make sure your Wi-Fi on your PC/mobile device is turned on. Search for available connections.
3. When the instrument is found, connect it to your PC/mobile device.
4. As soon as the connection is established, start the web browser. Enter into the address bar the IP http://192.168.10.1. A login-window pops up.
5. Enter user name and password. The default values are:
 - User name: admin
 - Password: password
6. After a successful login the info start screen of the Zenith35 Pro WebManager will appear and the instrument can be accessed.

Menu functions

Function	Description
Hardware Information	To view the current status of the GNSS instrument as well as the instrument firmware.
Position/link Information	To view the current position and link setting.
Satellite settings	To view all currently available satellites and the option to enable or disable each satellite and each satellite system.
Sensor settings	To view and configure the sensor and data link.
Format sensor	To format the memory, reset to factory settings, backup data or restart the instrument.
License key file	To upload license key files. Refer to "Upload key".
Firmware file	To upload instrument, UHF and ME firmware. Refer to "Sensor firmware".
Language file	To upload language files.
Antenna file	To upload base antenna calibration values to the instrument.
Data Download	To download raw data files from instrument or the microSD card in DAT or RINEX format. Refer to "Data download".

Download data

At the **Data Download** Tab select the file that you want to download. Both .DAT and Rinex files can be directly downloaded. The raw data is transferred from the instrument to PC where it is processed using the GeoMax Geo Office software.

Radio settings



To meet country radio licence requirements, the internal UHF radio must be set before use to legally allowed local frequencies as defined by local or governmental authorities. Use of forbidden frequencies may lead to prosecution and penalties.

At the **Sensor Settings** screen the internal radio can be configured with default channel, protocol type, channel spacing, transmission power and unit ID. Various required frequencies can be entered into the channel table and assigned to a specific channel number.

Sensor firmware

The latest version of the instrument firmware is available from the GeoMax website.

License key

Optional GNSS receiver licences are activated with a key file.

At the **Licence Key** file screen browse for the key file on your PC and click **Upload**. A confirmation message is shown once the option has been activated.

4.3

Batteries

4.3.1

Operating Principles

Charging / first-time use

- The battery must be charged prior to using it for the first time because it is delivered with an energy content as low as possible.
- The permissible temperature range for charging is between -10°C to $+55^{\circ}\text{C}$ / $+14^{\circ}\text{F}$ to $+131^{\circ}\text{F}$. For optimal charging we recommend charging the batteries at a low ambient temperature of $+10^{\circ}\text{C}$ to $+45^{\circ}\text{C}$ / $+50^{\circ}\text{F}$ to 113°F if possible.
- It is normal for the battery to become warm during charging. Using the chargers recommended by GeoMax, it is not possible to charge the battery if the temperature is too high.
- For new batteries or batteries that have been stored for a long time ($>$ three months), it is effectual to make only one charge/discharge cycle.
- For Li-Ion batteries, a single discharging and charging cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a GeoMax product deviates significantly from the actual battery capacity available.

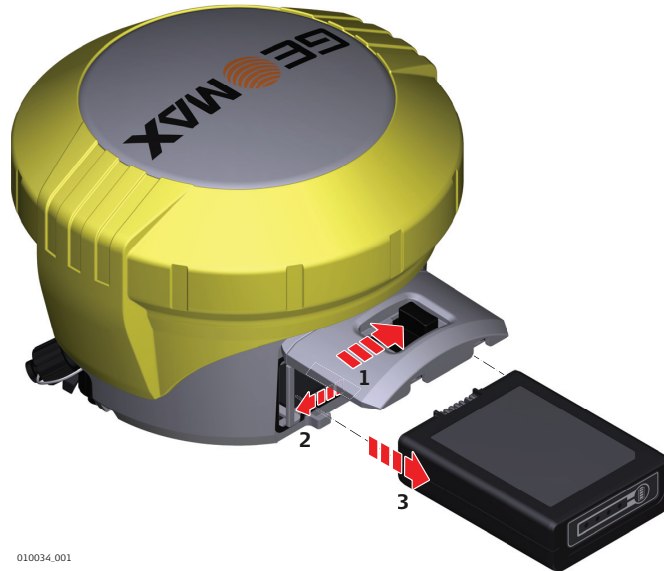
Operation / Discharging

- The batteries can be operated from -20°C to $+60^{\circ}\text{C}$ / -4°F to $+140^{\circ}\text{F}$.
- Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery.

4.3.2

Insert and Remove the Battery

Change battery step-by-step



010034.001



The battery is inserted at the side of the instrument.

1. To remove a battery, push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol and open the battery compartment.
2. Push the locker sideward and at the same time pull out the battery. This releases the battery from its fixed position.
3. Remove the battery.
4. To insert battery, push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol.
5. Open the battery compartment.
6. With the battery contacts facing upwards, slide the battery into the battery compartment.
7. Push the battery backwards so that it locks into position.
8. Close the battery compartment and push the slide fastener in the direction of the arrow with the close-lock symbol.

4.4

Inserting a microSD/SIM Card

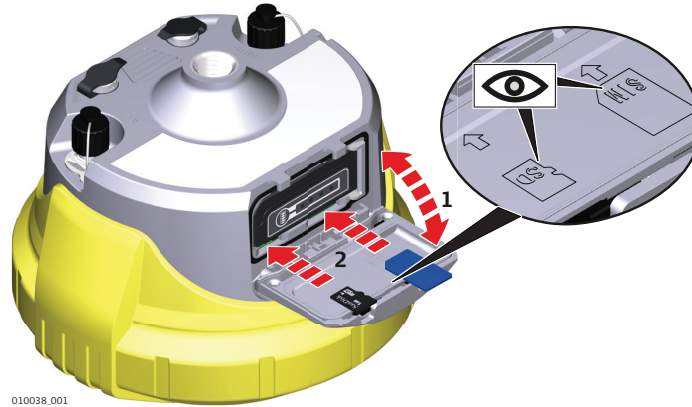


- Keep the card dry.
- Use it only within the specified temperature range.
- Do not bend the card.
- Protect the card from direct impacts.



Failure to follow these instructions could result in data loss and/or permanent damage to the card.

Inserting a microSD /SIM card step-by-step



Inserting a microSD card



Removing the microSD card while the instrument is turned on can cause loss of data. Only remove the microSD card or unplug connecting cables when the instrument is switched off.



The microSD card is inserted into a slot inside the battery compartment of the instrument.

1. Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol. Open the battery compartment
2. Slide the microSD card with the logo facing upwards firmly into the slot as shown inside the battery lid until it clicks into position.

Inserting a SIM card



Inserting/removing the SIM card while the Zenith35 Pro is turned on can result in permanent damage to the card. Only insert/remove the SIM card when the Zenith35 Pro is switched off.



The SIM card is inserted into a slot inside the battery compartment.

1. Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol. Open the battery compartment
2. Slide the SIM card with the connectors facing downwards firmly into the slot as shown inside the battery lid until it clicks into position.

5 Care and Transport

5.1 Transport

Transport in the field

When transporting the equipment in the field, always make sure that you

- either carry the product in its original container,
 - or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright.
-

Transport in a road vehicle

Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its container and secure it.

For products for which no container is available use the original packaging or its equivalent.

Shipping

When transporting the product by rail, air or sea, always use the complete original GeoMax packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.

Shipping, transport of batteries

When transporting or shipping batteries, the person responsible for the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

5.2 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to [6 Technical Data](#) for information about temperature limits.

Li-Ion batteries

- Refer to [6 Technical Data](#) for information about storage temperature range
 - Remove batteries from the product and the charger before storing
 - After storage recharge batteries before using
 - Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use
 - A storage temperature range of 0 °C to +30 °C / +32 °F to +86 °F in a dry environment is recommended to minimize self-discharging of the battery
 - At the recommended storage temperature range, batteries containing a 40% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged
-

5.3 Cleaning and Drying

Product and accessories

- Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; these may attack the polymer components.
-

Damp products

Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than 40°C/104°F and clean them. Remove the battery cover and dry the battery compartment. Do not repack until everything is dry. Always close the transport container when using in the field.

Cables and plugs

Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.

Connectors with dust caps

Wet connectors must be dry before attaching the dust cap.

6 Technical Data

6.1 Technical Data

6.1.1 Tracking Characteristics

Tracking GNSS receiver: NovAtel OEM719 multi-frequency with 555 channels.

Satellite system	Signals
GPS tracking	L1, L2, L2C, L5
GLONASS tracking	L1, L2, L3*
BeiDou tracking	B1, B2, B3**
Galileo tracking	E1, E5a, E5b, AltBOC, E6**
Positioning rate	5 Hz, 20 Hz (optional for Zenith35 Pro TAG)
SBAS	EGNOS, WAAS, MSAS, GAGAN, QZSS***

Initialisation: Initialisation time <5 s
Initialisation reliability >99.9%

* GLONASS L3 will be provided through future firmware upgrade.

** Believe to comply. Subject to ICD description availability.

*** Support of QZSS is incorporated and will be provided through future firmware upgrade when QZSS will be operational.

6.1.2 Accuracy

Differential code The baseline precision of a differential code solution for static and kinematic surveys is 25 cm.

Static

Mode	Value
Horizontal	3 mm + 0.5 ppm
Vertical	5 mm + 0.5 ppm

Static long

Mode	Value
Horizontal	3 mm + 0.1 ppm
Vertical	3.5 mm + 0.4 ppm

Kinematic

Mode	Value
Horizontal	8 mm + 1 ppm
Vertical	15 mm + 1 ppm



Accuracy is dependent upon various factors including the number of satellites tracked, constellation geometry, observation time, ephemeris accuracy, ionospheric disturbance, multipath and resolved ambiguities.

The accuracies, given as **root mean square**, are based on measurements processed using GeoMax Geo Office and on real-time measurements.

The use of multiple GNSS systems can increase accuracy by up to 30% relative to GPS only.

6.1.3 GNSS antenna specifications

GNSS antenna specifications	Phase centre offset:	± 2 mm
	LNA gain:	Typically 28 dBi

6.1.4 Internal devices

Internal devices	GSM/UMTS module:	Cinterion PHS8 Quad-Band GSM 850/900/1800/1900 MHz Penta-Band UMTS 800/850/900/1900/2100 MHz
	UHF radio module:	Satel M3-TR4 Transmission power 0.5 and 1.0 W Frequency range 403 to 473 MHz
	Bluetooth:	Class 2

6.1.5 Technical Data

Dimensions	Height:	131 mm (5.2")
	Diameter:	161 mm (6.3")

Weight	Zenith35 Pro:	1.170 kg (without battery)
---------------	---------------	----------------------------

Recording	GNSS raw data can be recorded on a microSD card or internal memory. 1 GB capacity is typically sufficient for about 7000 h dual frequency logging at a 15 s rate (average constellation).	
	<ul style="list-style-type: none"> Internal memory: 8 GB microSD card: 4 GB 	

Power	Internal battery:	Li-Ion battery 10.8 V/3.4 Ah
	External power input:	9 V to 18 V DC external power input with over-voltage protection up to 28 V with ZDC221 cable
	Power consumption:	Typically 5.5 W (Wi-Fi on)/5.0 W (Wi-Fi off)

Operating times	Equipment type	Operating time ZBA601
	Static:	8.5 h
	Rover (radio; Satel M3-TR4, receive):	6 h
	Rover (Digital cellular phone; Cinterion PHS8-P):	6.25 h



Operating times may vary depending on the temperature and battery age.

6.1.6 Environmental specifications

Environmental specifications	Temperatures (°C):		
	Instrument:	-40 to +65 (operation*)	-40 to +85 (storage)
	Battery:	-40 to +65 (operation)	-40 to +70 (storage)

Protection:

IP68 (IEC 60529)

Vibration:

ASAE EP455 Section 5.15.1 Random, MIL-STD-810G, method 514.6E-I

Shock:

Withstands a 2 m (6.6 ft) pole topple over onto hard surface.

Humidity:

100% condensing


The effects of condensation are to be effectively counteracted by periodically drying out the instrument.

* Tilt & Go functionality: -30°C to +65°C

6.2

Conformity to National Regulations

Conformity to national regulations

- FCC Part 15, 22 and 24 (applicable in US)
- Hereby, GeoMax AG declares that the radio equipment type Zenith35 Pro is in compliance with Directive 2014/53/EU and other applicable European Directives. The full text of the EU declaration of conformity is available at the following Internet address: <https://geomax-positioning.com/partner-area>.
- This Class 2 equipment may be operated in: AT, BE, BG, CA, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, RU, RO, SE, SI, SK, US.
-  Class 2 equipment according to European Directive 2014/53/EU (RED) for which following EEA Member States apply restrictions on the placing on the market or on the putting into service or require authorisation for use:
 - France
 - Italy
 - Norway (if used in the geographical area within a radius of 20 km from the centre of Ny-Ålesund)
- The conformity for countries with other national regulations not covered by the FCC part 22 and 24 or European Directive 2014/53/EU has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance.
 - This device is granted pursuant to the Japanese Radio Law (電波法) and the Japanese Telecommunications Business Law (電気通信事業法).
 - This device should not be modified (otherwise the granted designation number will become invalid).

Frequency band

Type	Frequency band (MHz)
GNSS receiver	GPS L1: 1575.42 GPS L2: 1227.60 GPS L5: 1176.45 GLONASS L1: 1602.5625 - 1611.5 GLONASS L2: 1246.4375 - 1254.3 Galileo E1: 1575.42 Galileo E5a: 1176.45 Galileo E5b: 1207.14 Galileo AltBOC: 1191.795 BeiDou B1: 1561.098 BeiDou B2: 1207.140
Bluetooth	2402 - 2480
Radio:	403 - 473
2G GSM	Quad-Band EGSM 850/900/1800/1900 GPRS multi-slot class 10
3.75 GSM/UMTS	Quad-Band GSM 850/900/1800/1900 Penta-Band UMTS 800/850/900/1900/2100

Output power

Type	Output Power [mW]
GNSS	Receive only
Bluetooth	5
Radio	500, 1000
2G GSM EGSM850/900	2000
2G GSM GSM1800/1900	1000
3G UMTS 800/850/900/1900/2100	250

Antenna

Type	Antenna	Gain [dBi]
GNSS:	Internal GNSS antenna element (receive only)	28
Blue-tooth:	Internal ceramic antenna	4.5 max.
UHF:	Detachable $\lambda/4$ antenna	4 max.
GSM/ UMTS:	Primary: Detachable $\lambda/2$ antenna	max.2dBi @ 800/850/900 MHz max. 2dBi @ 1800/1900/2100 M Hz
	Secondary: Internal patch antenna	max.1dBi @ 800/850/900 MHz max. 1dBi @ 1800/1900/2100 M Hz
Wi-Fi:	Internal ceramic antenna	4.5 max.

6.3

Dangerous Goods Regulations

Dangerous Goods Regulations

The products of GeoMax are powered by Lithium batteries.

Lithium batteries can be dangerous under certain conditions and can pose a safety hazard. In certain conditions, Lithium batteries can overheat and ignite.



When carrying or shipping your GeoMax product with Lithium batteries onboard a commercial aircraft, you must do so in accordance with the **IATA Dangerous Goods Regulations**.



GeoMax has developed **Guidelines** on "How to carry GeoMax products" and "How to ship GeoMax products" with Lithium batteries. Before any transportation of a GeoMax product, we ask you to consult these guidelines on our web page (<http://www.geomax-positioning.com/dgr>) to ensure that you are in accordance with the IATA Dangerous Goods Regulations and that the GeoMax products can be transported correctly.



Damaged or defective batteries are prohibited from being carried or transported onboard any aircraft. Therefore, ensure that the condition of any battery is safe for transportation.

848674-1.1.2en

Original text (848674-1.1.2en)

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